ENERGY IN MANITOBA
SUPPLY AND DEMAND

PUBLISHED BY THE MANITOBA ENERGY COUNCIL

FEB 12 1975
RECEIVED

ENERGY IN MANITOBA

Supply And Demand

Published by
The Manitoba Energy Council

Winnipeg, Canada, 1974

LEGISLATIVE LIBRARY
WITHDRAWN
LEGISLATIVE LIBRARY OF ONTARIO
TORONTO
FEB 12 1979
RECEIVED

FOREWORD

THE recent energy crisis demonstrated the ever-growing interdependence of people and events in this "global village". It focused attention in Manitoba on the need to pause and formulate a response to a possible severe restriction in the rate of energy use. A clear and objective understanding of how this province will be affected is vital to forward thinking and planning.

Initiative has to be taken at various levels of government and industry to deal with the development of an energy policy for Canada. For this initiative to be well-conceived, informed opinion is a prerequisite. The purpose of this publication is to examine current patterns of energy use in Manitoba. It represents part of an on-going program of research and planning whose objective is to ensure that the development and utilization of Manitoba's energy resources is consistent with our concern for a high standard of living in concert with our environment.

Leonard S. Evans

MINISTER
DEPARTMENT OF INDUSTRY AND COMMERCE

CHAIRMAN
THE MANITOBA ENERGY COUNCIL

104-03175/

The Manitoba Energy Council

Chairman: The Honourable Leonard S. Evans, M.A.
Minister of Industry and Commerce

Members: Leonard A. Bateman, P. Eng.
Chairman
Manitoba Hydro

James T. Cawley, P. Eng.
Deputy Minister
Department of Mines, Resources and
Environmental Management

David M. Peden, D.F.C., Q.C.
Chairman
The Public Utilities Board

Leonard Remis, B.A.
Deputy Minister
Department of Industry and Commerce

CONTENTS

	PAGE
Foreword	ii
The Manitoba Energy Council - Members	iii
Energy In Manitoba	1
Background to Recent Events	1
Development of Present Energy Use Patterns	2
Changes over Recent Years	2
Underlying Factors	6
Energy Use by Sector	10
Residential/Commercial	10
Industrial	14
Transportation	15
Energy Supply and Demand	16
Natural Gas	16
Petroleum	19
Coal	20
Electricity	20
Summary	20
Role of the Manitoba Energy Council	23
Appendix	25

Energy in Manitoba

BACKGROUND TO RECENT EVENTS

DURING the past few years increasing concern has been expressed over the direction that energy policies in Canada have taken. The last two years in particular have seen the intensification of debate over issues such as the federal export tax on crude petroleum destined for the United States, revision of procedures for estimating exportable surpluses of natural gas as well as for crude petroleum and other energy sources, development of the Athabasca tar sands, exploitation of high Arctic natural gas and oil, and efforts of the Provinces of Alberta and Saskatchewan to realize higher royalty rates from all forms of fossil fuels.

Much of the debate on energy policy has focused on sharply rising prices for crude petroleum on the world market coupled with temporary shortages of off-shore crude petroleum being imported into Quebec and the Atlantic Provinces. There is every indication that within the past two years, a significant shift has occurred in the pricing and relative availability of the major energy sources. Policy makers have lacked a proper framework for dealing with these radical shifts in conditions; consequently, major public debate has ensued over the direction that energy policies in Canada should take.

The Province of Manitoba has not been entirely isolated from the pressures which have affected Canada as a whole. Decisions made at a recent Federal/Provincial conference to raise the average wellhead price of Alberta crude oil to $6.50 per barrel, for example, have resulted in increased prices for motor gasoline and for other refined petroleum products. Some major revisions have also taken place in long term supply contracts for delivery of natural gas to demand centres in the province; residential consumers have, as a consequence, been facing higher home heating costs. The provincial power utility, Manitoba Hydro, has also been forced to raise its rates in response to higher construction and transmission costs.

This publication outlines the historical and the current energy use patterns in Manitoba in order to provide an overall perspective of trends in energy use in the province.

DEVELOPMENT OF PRESENT ENERGY USE PATTERNS

AS IN other regions of Canada, patterns of energy utilization in Manitoba have undergone marked change since the end of World War II. Availability and proximity of certain energy sources such as hydro-electricity and natural gas have, however, produced a pattern of use not duplicated elsewhere in Canada.

This distinctive pattern derives primarily from a different path of development pursued in Manitoba with respect to energy sources and use. As recently as 1945-1950, the use of energy in Manitoba bore remarkable similarity to patterns being experienced in other areas of Canada, that is:

(a) In the residential/commercial sector heavy reliance was placed on wood and on coal for space heating purposes. Small and large suppliers were responsible for handling the sale of coal and (to a lesser extent) wood throughout the province. Electricity was used mainly for major household appliances such as stoves and refrigerators, as well as for lighting. Until the advent of rural electrification, many farms in Manitoba were without alternatives to coal, wood, or refined petroleum products such as kerosene for heating and other purposes.

(b) In the industrial sector the principal fuel used for boilers was coal; directly or indirectly, coal was used almost exclusively for space heating purposes, for process heat and for other applications during this period.

(c) In the transportation sector, railways were heavy users of coal for locomotive purposes; only automobiles, commercial trucking and aircraft consumed petroleum derivatives (motor and aviation gasoline) to any appreciable extent.

(d) As a secondary energy source, electricity was for the most part generated in Manitoba by hydro-electric stations located on the Winnipeg River. Thermal plants were used for peak load purposes and for supplying local demands.

This pattern of energy use in Manitoba was relatively stable and similar to that prevailing in other provinces of Canada. Changing patterns of energy use in Manitoba since the early 1960's as well as discussion of the principal forces which led to these changes are outlined below.

Changes over Recent Years

Data on energy use in Manitoba over the ten year period 1961-1971 by sector and energy form are presented in Graphs 1 and 2, respectively. Quantities are calculated in trillions of BTU's (British Thermal Units) in order to permit direct comparison. (A BTU is defined as the amount of heat required to raise the temperature of one pound of water one degree Fahrenheit.)

Graph 1 shows energy demand in Manitoba for the three principal sectors: residential/commercial, industrial and transportation. For comparison purposes, data pertaining to Canada are also presented. Petrochemical and other non-fuel uses are excluded as the amount consumed is relatively insignificant in Manitoba. Overall growth in energy demand in Manitoba by sector has been modest in comparison to that for Canada. For example, total residential/commercial energy demand in Manitoba has grown by approximately 58 per cent during this period, in contrast to 77 per cent in Canada. Industrial demand has grown by 42 per cent in Manitoba and 60 per cent in Canada.

The slower growth rates can in large measure be attributed to the relatively slower rate of population growth in Manitoba. During the period 1961-1971, Manitoba's population increased from 922,000 to 988,000—an increase of 7 per cent. In contrast, the rate of growth in population for Canada as a whole was 19 per cent—from 18.2 million in 1961 to 21.6 million in 1971. If Manitoba's overall growth in energy use is, however, factored by the rate of growth in population, it follows that per capita growth in energy use in the residential/commercial sector has grown faster in Manitoba than in Canada as a whole.

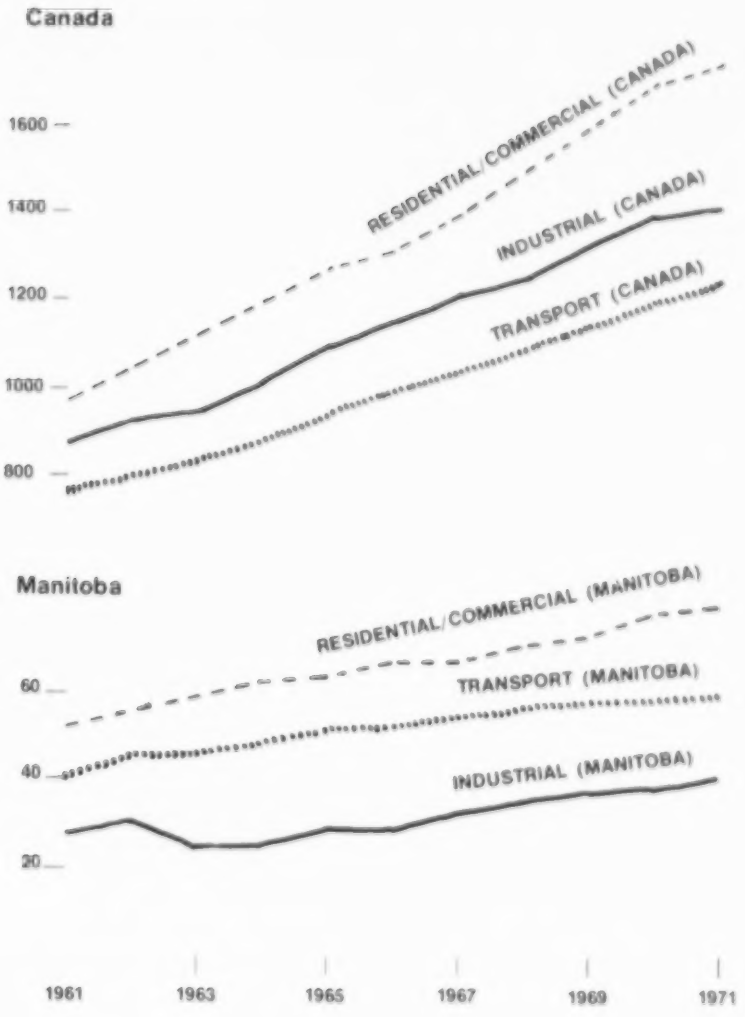
Graph 2 reviews energy demand in Manitoba by energy form and indicates some notable trends. Both Manitoba and Canada record substantial declines in the use of coal, with a drop of 64 per cent in the case of Manitoba and almost 45 per cent in the case of Canada. Natural gas consumption on the other hand has risen by nearly three-fold in Canada and by more than five-fold in Manitoba.

Sharp increases in Manitoba energy consumption have also been recorded for electricity where the rate of growth in Manitoba (175 per cent) was comparable to the rate of growth for Canada as a whole (179 per cent). As Manitoba's population growth during this period was roughly one-half that of Canada, it follows that per capita electricity consumption in Manitoba has been growing at roughly twice the rate experienced in Canada as a whole. This trend reflects to a considerable extent the proximity and availability of electrical supply from the Nelson River and related hydro developments.

The rates of growth experienced in the past 10 years in energy consumption have varied with respect to both use and energy forms. In particular, the sharpest rates of growth have occurred in the residential/commercial sector, and in the forms of electricity and natural gas. Traditional sources of energy such as coal have undergone major declines in utilization over this period.

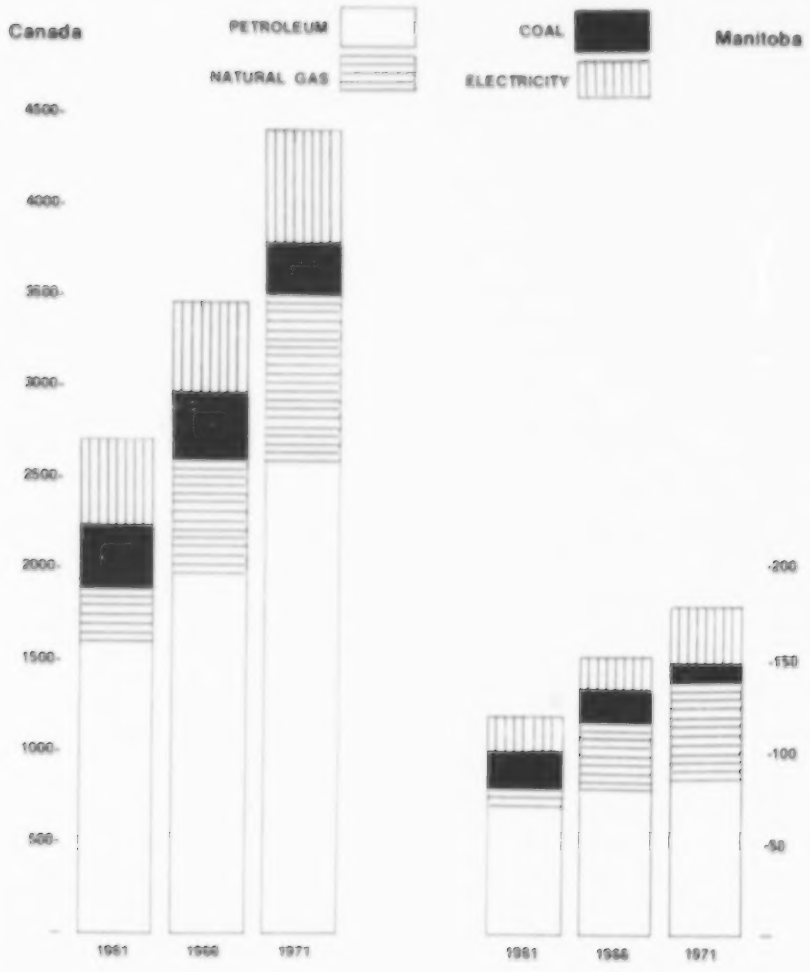
GRAPH 1

ENERGY DEMAND IN MANITOBA & CANADA BY SECTOR
(Trillions of BTU's)



GRAPH 2: ENERGY DEMAND IN MANITOBA & CANADA BY ENERGY SOURCE

(Trillions of BTU's)



Underlying Factors

Several different factors can be identified as generating the major changes in patterns of energy use discussed above. Perhaps of foremost importance has been the increase in the general standard of living which in turn has generated demands for both particular types and uses of energy. Increasing disposable incomes have, for example, usually been associated with increases in both the stock and use of private automobiles, purchase of household appliances such as frost-free refrigerators, colour television sets, dishwashers, small electric appliances, and increased use of plastics and other petrochemical products. These goods and activities—and the production processes implied by them—have required increased energy supplies in Manitoba and in other provinces. Without this increase in disposable income, it is apparent not only that the present-day patterns of energy use would be of a different order of magnitude, but also that the relative uses of various energy forms would vary significantly. In particular, increased demands for electricity and natural gas for space heating and other purposes would probably not have developed to the extent that has occurred over this period.

Growth in demand has not been the only factor responsible for changes in energy use patterns in Manitoba and elsewhere in Canada. Dramatic advances in technology and efficiency of use when coupled with the introduction of energy forms not previously available locally to any major extent also influenced the pattern of utilization in Manitoba and have led to the ascendancy of liquid and gaseous petroleum energy products (petroleum, natural gas) over conventional coal and wood sources.

Five factors are particularly relevant to explain the shifts which have occurred among energy forms in the past 15 to 20 years:

1. *Conversion from coal to oil for space heating purposes.* The development of automated oil burner furnaces in the early 1950's afforded residential and other users the opportunity of shifting away from coal furnaces to oil furnaces. The added convenience and cleanliness of oil (and, later, natural gas) meant that coal since the end of World War II was progressively eliminated as a source of fuel for residential and other space heating purposes.
2. *Railway modernization program.* Also relevant from a technological point of view was the major program of changeover to diesel locomotion undertaken by Canada's two major railways in the late 1950's. Conversion of operations from coal and (to a lesser extent) from light fuel oil to diesel oil, permitted major increases in efficiencies of operation; for example, longer hauls between stop-overs, increased ton-miles hauled per energy unit.

(Similar features were also likely taken into account in the shift of airline companies away from conventional propeller aircraft to jet aircraft. Moreover, the electric transportation systems of nearly all large urban centres were also converted to diesel motive power during this period.)

3. *Price of crude and refined petroleum products.* Inter-fuel competition, especially in the industrial and transportation sectors, is governed to a large extent by relative prices and availability of fuel sources. In a world-wide context, petroleum-based fuels have been able to increase their energy market share through both rapid exploitation of reserves in areas such as the Middle East and the movement of crude petroleum by supertanker to final demand markets in North America and Europe. Increasing levels of production throughout the 1950's and the 1960's led to absolute declines in prices paid for crude petroleum; in Canada, lower prices for petroleum in effect squeezed out higher priced coal in all markets except those associated with local steam raising and metallurgical applications.

   Throughout the 1960's prices paid for crude petroleum and refined petroleum products in Manitoba were partially isolated from these declines in world prices by provisions of the National Oil Policy whereby Western Canada and Ontario markets for crude petroleum were reserved for Canadian crude production. In practice, this policy implied prices for crude petroleum higher than might otherwise have prevailed, but in a relative price sense refined petroleum products still continued to gain at the expense of conventional sources of energy such as coal and wood.

   Also influencing this trend was the proximity to Manitoba of Canadian crude petroleum production; that is, increasing demands for petroleum products in the province were met by production in Alberta and (to a lesser extent) Saskatchewan. In general, development of these markets was strengthened by construction of the Inter-Provincial Pipeline from Alberta to Manitoba, and the refining of products at two refineries located in the Winnipeg area.

4. *Price of natural gas.* Beginning in the 1950's, major efforts were made in Canada to process natural gas for sale as a fuel rather than simply flaring the gas or reinjecting it into production wells in order to increase flows of crude petroleum. These efforts necessitated construction of large diameter transmission pipelines to markets in Canada as far east as Montreal, and to export positions in the United States. During this period of rapid expansion, producers of natural gas were prepared to accept low wellhead prices in order to penetrate both domestic and United

States markets. The net result was that in Manitoba — and to varying degrees in other parts of Canada as well — natural gas assumed a premium value over other fuel sources, attracting users on both a firm and interruptible basis. In Manitoba, penetration by natural gas into the energy market was particularly noticeable for residential and commercial space and water heating purposes.

5. *Price of electricity.* There is considerable empirical evidence (especially in the United States) to suggest that electricity can penetrate all major energy sectors at the expense of other energy forms — provided the price is right. Although hydro-electric projects require massive amounts of capital for construction, they do have the advantage of being relatively constant cost operations thereafter. Although Manitoba Hydro, like other utilities, experienced increases in both capital construction costs and financing costs during the past 15 to 20 years, rates for electricity use have remained relatively constant over that time period.

Table 1 details information on average prices paid for electricity and for natural gas in the residential, commercial and industrial sectors for the time period 1966-1973. Although prices are not on the basis of BTU's and therefore not directly comparable, the relative constancy of prices is particularly striking. In the case of electricity, average revenue per thousand kilowatt hours for all sectors since 1966 has in general fluctuated between 10 1/2 to 11 dollars. Similarly, in the case of natural gas, average revenue per thousand cubic feet has virtually remained at 65 cents since 1971.

Although "city gate" prices for natural gas and rates on electricity usage have both increased in 1974, Table 1 emphasizes the continued relative attractiveness of these two fuel forms. The effect which prices and availability of such energy forms have had on all consuming sectors cannot be underestimated, especially in the case of the industrial and commercial sectors, where choice of fuel form is determined more or less on the basis of cost minimization criteria.

The forces at work on both the supply and demand side of the energy market in Manitoba have acted to shift energy utilization away from heavy reliance on coal and wood and towards electricity, natural gas and petroleum. Manitoba is distinguished by a relatively heavy emphasis on the use of electricity and of natural gas for space heating purposes in the residential market. This process has been due in part to increased demands placed on energy products which offer convenience, ease of handling and similar characteristics. The shift, however, has not been due entirely to demand factors: price, technology, and availability have also influenced the choice of energy forms in the province. The development of

TABLE 1

Average Prices For Electricity And Natural Gas In Manitoba 1966 - 1973

ELECTRICITY ($/MWh)

	Residential & Farm	Commercial	Industrial	Street Lighting	Total (Average)*
1966	11.78	15.01	7.93	23.82	10.67
1967	11.68	15.21	8.14	24.62	10.76
1968	12.64	15.62	7.69	25.73	10.96
1969	13.54	18.19	7.52	26.30	11.62
1970	13.45	15.18	7.48	26.60	11.01
1971	13.40	14.94	6.95	26.95	10.49
1972	13.90	14.75	6.86	26.94	10.38

NATURAL GAS ($/MCF)

	Residential	Commercial	Industrial	Total (Average)*
1966	0.92	0.70	0.32	0.68
1967	0.87	0.70	0.31	0.66
1968	0.89	0.69	0.30	0.64
1969	0.87	0.67	0.30	0.63
1970	0.87	0.67	0.31	0.64
1971	0.90	0.67	0.34	0.65
1972	0.90	0.68	0.33	0.65
1973	0.94	0.70	0.34	0.65

* The "average" is derived from quantity used and price in each category.

Source: Statistics Canada

hydro-electric power at Grand Rapids and on the Nelson River, plus exploitation of crude petroleum and natural gas reserves in Alberta and Saskatchewan have contributed to an emphasis on these energy forms in the province of Manitoba.

ENERGY USE BY SECTOR

FOR purposes of examination and analysis, the energy market is usually divided into three major sectors: the residential/commercial market, the industrial market and the transportation market. It is also usual in the electricity sector to distinguish the use of coal, oil and natural gas for the purposes of generating electricity. In Manitoba, fossil fuel use is relatively minor when compared to the base loads provided by hydro-electric generating stations.

Table 2 lists generating capacity in both the Manitoba Hydro and Winnipeg Hydro systems. Out of a total generating capacity of 2,293,718 kilowatts, hydraulic capacity accounts for 1,868,000 kilowatts or 81 per cent of total generating capacity as of March 1973. Coal-fired stations are responsible for a further 16 per cent of generating capacity, followed by diesel turbines and gas turbines each accounting for slightly over one per cent.

The following discussion of energy use in Manitoba is organized according to use in particular final demand sectors. It therefore excludes considerations relating to generation of electricity and the use of fossil fuels for the petrochemical industry and other feedstocks.

Residential/Commercial

In analysing energy use in the residential/commercial sector it is customary to identify and examine particular factors which influence the level and composition of energy demand. Foremost among these are absolute levels of population and relative rates of population growth, numbers of households, the split between apartment and house dwellers, and requirements for space heating and lighting.

The largest single element of residential/commercial energy demand in Manitoba is the need for residential and commercial space heating. Comprehensive estimates of residential and commercial space heating requirements are, however, not available for Manitoba. Estimates of average annual energy use for heating purposes for residential households over the period 1958-1969 indicate that the average household in the Prairie Provinces consumed approximately 187 million BTU's of

TABLE 2

Electricity Generation Capacity In Manitoba In Kilowatts

Interconnected Capacities		% of Total
Hydraulic	1,868,000	81.4
Thermal	369,000	16.1
Gas Turbine	25,000	1.1
Diesel	4,000	.2
Isolated Capacities		
Diesel	27,718	1.2
Total Generating Capacity	2,293,718	100.0

Source: Manitoba Hydro-Electric Board, Annual Report, March 31, 1973.

energy per year—18 per cent above the Canadian average of 158 million BTU's. Applying this measure to Manitoba and assuming 287,915 (Census) households in Manitoba in 1971, it is estimated that demand for residential space heating in the province amounted to 53.8 trillion BTU's, or 67 per cent of all residential/commercial energy requirements.

Residential and commercial space heating can be provided by a number of different energy forms. Between 1961 and 1971 the fuel used in most Manitoba households for space heating purposes changed from heating oil to natural gas. In 1971, 153,375 out of a total of 287,915 households (53 per cent) were using natural gas for heat. After natural gas came home heating oil with 92,910 homes being serviced by this energy form. In descending order of importance, other energy forms used for residential space heating purposes were electricity (19,325 households), wood (11,210 households), and coal (6,100 households). In projecting energy requirements to 1990, the National Energy Board assumed that the fastest growing market for residential space heating would be in electricity—although even by 1990 it would account for less than nine per cent of all household use in the province.

Most other requirements for energy in the residential and commercial sector are met through electricity. The only exception is the use of natural gas for certain specialized applications such as water heating, clothes drying, and stoves. Only electricity is a practical form of energy for the operation of equipment such as lighting apparatus, small appliances, and television. This is also true with respect to the use of business machines, computers and various other energy-using devices in commercial operations.

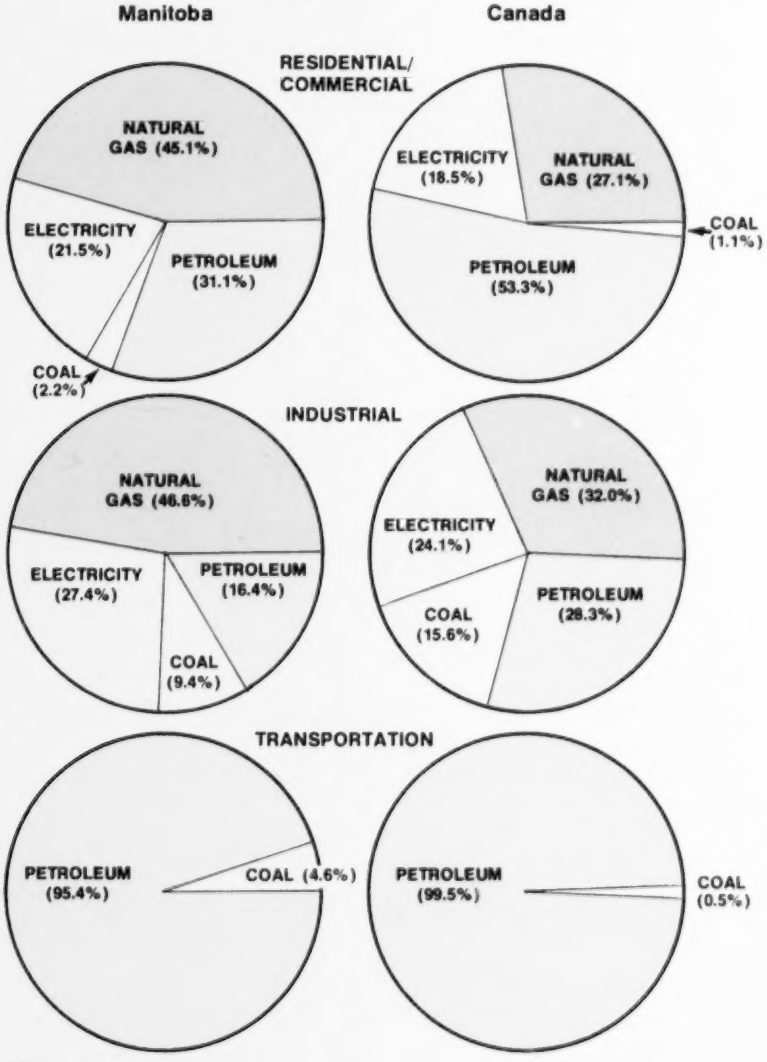
Diagram 1 shows the percentage of the residential/commercial market held by each energy form in Canada and in Manitoba for the year 1971. A review of data has yielded the following conclusions:

1. In Canada as a whole, natural gas had by 1971 secured only 27 per cent of the residential/commercial market. Although the share of the national market held by natural gas has been more or less increasing since the early 1960's, it is still substantially smaller than the roughly 45 per cent share controlled by natural gas in the Manitoba residential/commercial sector. The share prevailing in Canada in 1971 was in fact surpassed in Manitoba in the early 1960's, as gas supplied by TransCanada PipeLines Limited to the three major distribution utilities in Manitoba quickly supplanted other sources of energy in this sector.
2. Reflecting proximity to relatively low cost sources of electric power, the share of the residential/commercial market held by electricity is higher in Manitoba (22 per cent) than in Canada (19 per cent). Again, in both Canada and in Manitoba, there has been a tendency for electricity to increase its share of this sector over

DIAGRAM 1

ENERGY DEMAND BY SECTOR IN MANITOBA & CANADA, 1971

BY PERCENT



Source: Statistics Canada

time. To some extent this trend has been due to increased use of electricity for residential (particularly apartment) and commercial space heating purposes, but it also reflects increasing use of electricity for non-space heating purposes.

3. Coal represents only a negligible proportion of consumption in the residential/commercial sector, although as recently as fifteen years ago, coal held over 50 per cent of the residential/commercial market in Manitoba and approximately 33 per cent in Canada. By 1971 the percentage share had fallen to one per cent in Canada and 2 per cent in Manitoba. This was the fuel form increasingly supplanted by both natural gas and electricity.
4. In Canada as a whole, petroleum represents the single largest energy form used in the residential/commercial sector, accounting for slightly over 53 per cent of the market. Although this percentage has declined from the levels attained in the early sixties the share continues to be of the same order of magnitude as in the mid-1950's. The experience in Manitoba has been similar, with the share enjoyed by petroleum increasing during the early 1950's and declining thereafter as both natural gas and electricity continued to make inroads in the market. In contrast to Canada, the share held by petroleum (31 per cent) is 15 to 20 percentage points lower than that experienced 10 years before.

It is evident from this diagram that consumption of energy in the residential/commercial sector in Manitoba differs markedly from that prevailing in Canada as a whole. Specifically, there is a much heavier reliance on natural gas as opposed to petroleum for space heating purposes and electricity represents a slightly higher share of the market in Manitoba than in Canada as a whole.

Industrial

Patterns of energy use in the industrial sector are governed less by personal preference than by the economics of energy utilization, that is, relative costs of using one form of energy in preference to another form. Engineering criteria also influence the choice of energy form. An industry may, for example, choose natural gas over other energy forms simply because it requires a precise and clean form of heat. Some energy forms are required not only for their heat value, but also for other industrial applications.

Diagram 1 illustrates energy consumption by form in the industrial sector in Canada and Manitoba in 1971. Major variations are evident between the Manitoba and Canadian pattern:

1. Natural gas is again relatively more important in Manitoba (47 per cent) than in Canada as a whole (32 per cent). This reflects — as

it does in the residential/commercial sector — the relative availability and cost of natural gas in the province. It also reflects the absence in Manitoba of large industrial requirements of coal for metallurgical and other purposes.

2. In Canada, the second largest share of the industrial demand for energy is accounted for by petroleum, which in 1971 represented 28 per cent of total energy consumed. Petroleum had been the single largest energy form used in Canada since the early 1950's, when it supplanted coal. Petroleum in Manitoba has, within the last 15 years, always been relatively more important than coal in the industrial sector, but its share in the Manitoba market (16 per cent in 1971) has declined as the consumption of natural gas and (to a lesser extent) electricity has risen.
3. Coal in the industrial sector has been in declining use in both Canada and in Manitoba. The relatively higher rate for Canada reflects the influence of the province of Ontario, where approximately one-quarter of all industrial energy consumption (primarily for metallurgical purposes in the iron and steel industry) continues to be supplied by coal. This pattern of industrial location is not repeated to any significant extent elsewhere in Canada with the result that use of coal for energy purposes tends to be of relatively minor significance in other regions of the country.
4. Electricity is relatively more important in Manitoba (27 per cent) than is the case in Canada (24 per cent). This greater emphasis on electricity in Manitoba is partially explained by the heavy demands of mining operations in Northern Manitoba. It also reflects the availability over a long period of time of low cost electric power.

Manitoba's utilization of energy for industrial purposes varies from Canada's in that relatively more natural gas and electricity are consumed in the province. This pattern reflects both the relative availability of these two energy sources and also the industry mix in the province; for example, coal requirements for metallurgical purposes are small and electricity demands for the mining industry are significant.

Transportation

Included in the transportation sector are energy uses associated with different modes of surface, air and water transport, or more specifically, private automobile transport, commercial trucking, rail transport, marine transport and aircraft.

Diagram 1 shows the percentage of energy consumption in the transportation sector by form for the year 1971 in both Canada and Manitoba.

Estimates for electricity required for mass transportation systems (such as trolley cars) are not included in this table. Petroleum dominates as the major energy fuel, with anywhere from 95 to close to 100 per cent of the market in both Manitoba and Canada. Included under petroleum are products such as motor gasoline, diesel fuel, aviation gasoline and turbo fuel, as well as light and heavy fuel oil. Reflecting the requirement for portability of energy source, remaining energy demand in the transportation sector is met by coal, although its importance is relatively minor in comparison to conditions 15 to 25 years ago. The decline in the use of coal has reflected major conversion of the railways from coal locomotives to diesel engines as well as similar conversions in vessels plying the Great Lakes and other waterways.

The share held by petroleum would have increased even if both the rail and marine transport sectors had remained heavily dependent on coal as a source of energy. In particular, the shift of transport towards private automobile and aircraft travel would obviously have increased the share of the transport market held by petroleum.

ENERGY SUPPLY AND DEMAND

THE data presented in the preceding section can be analysed to provide an indication of the extent to which various fuels and other energy forms are allocated to the servicing of particular markets. Importance in terms of quantity used is shown in Table 3 by form and final demand sector. Having outlined the extent of demand for each energy form, it is possible to discuss the source of supply for each and to evaluate the extent to which energy requirements in Manitoba are met by indigenous sources.

Natural Gas

Diagram 2 shows natural gas consumed in Manitoba by principal consumption sectors in 1971. The predominance of natural gas utilization in the residential/commercial sector is obvious as fully two-thirds of the natural gas consumed in the province is allocated to the residential and commercial markets. The remainder is allocated to the industrial sector, as very little natural gas is used in the generation of electricity and none is used in the transportation sector.

The natural gas consumed in Manitoba is supplied by interprovincial transfers, mainly from Alberta. The standard procedure has been for the

TABLE 3

Manitoba, Energy Sales by Sector 1971
(Trillions of BTU's)

	Residential	Commercial	Industrial	Transportation
Coal	1.6	.2	3.6	2.8
Oil	17.2	8.0	6.2	57.0
Natural Gas	20.3	16.2	17.4	-
Electricity	8.6	8.8	10.3	-

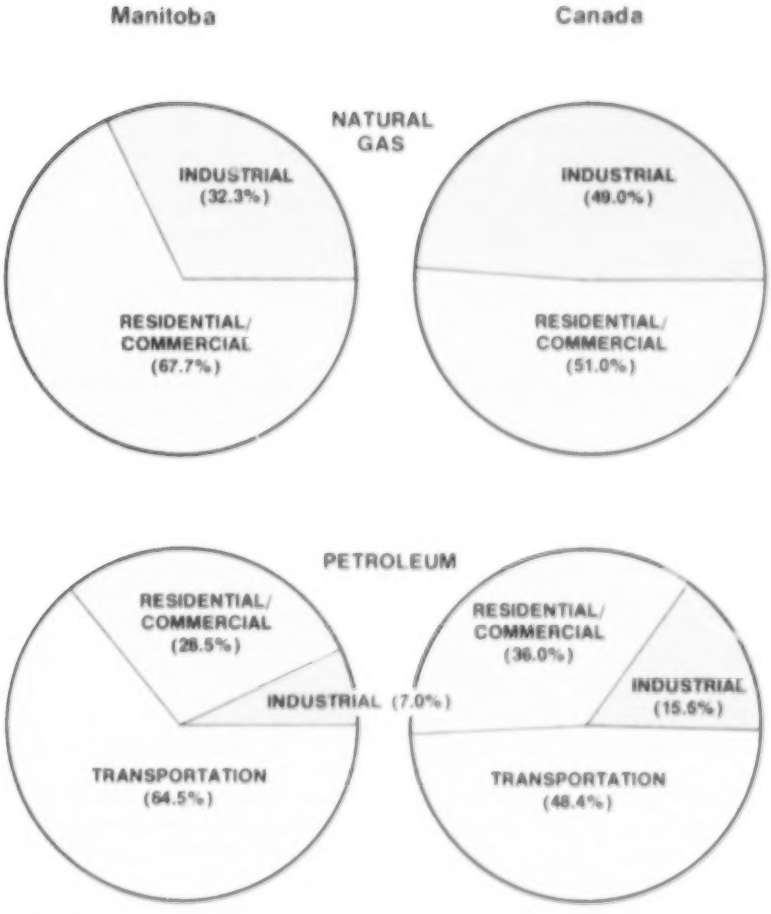
Note: Farm use of oil and electricity is allocated to the residential sector.

Source: Statistics Canada

DIAGRAM 2

ENERGY DEMAND BY TYPE OF ENERGY IN MANITOBA & CANADA, 1971

BY PERCENT



Source: Statistics Canada

three major distribution utilities in Manitoba to purchase their natural gas requirements from TransCanada PipeLines Limited on a contract demand basis for a specified number of cubic feet per year at an approved rate or toll. Contracts are generally of a long-term nature, reflecting the early efforts of the natural gas industry to penetrate markets outside of Alberta.

Manitoba is completely dependent on the other provinces for supply of one of the most vital energy forms in the province.

Petroleum

Diagram 2 illustrates the consumption pattern of petroleum in Manitoba and Canada by final demand sector in 1971. Almost two-thirds of the petroleum consumed in Manitoba is allocated to the transportation sector. This pattern reflects the emphasis given in Manitoba to natural gas and electricity in the other sectors and, conversely, the inability of natural gas and electricity to penetrate the transportation sector.

Most of the petroleum refining in Manitoba depends upon crude oil transferred from either Alberta or Saskatchewan while most of the production from the Virden oil fields is destined for other markets. It is estimated that about 50 per cent of crude petroleum production from Manitoba is exported to the United States. The majority of Manitoba's petroleum requirements are met by crude oil moved by pipeline into the province, processed in the two refineries in the Winnipeg area and subsequently shipped by tanker truck and tanker car to destinations throughout the province. Imperial Oil Limited is currently engaged in a program of concentrating its refining capacity in Edmonton and consideration is being given to the sale or closure of its refinery located in East St. Paul near Winnipeg.

Table 4 provides data on Manitoba petroleum production for selected years from 1952 to 1972. Production levels in Manitoba reached approximately six million barrels in the mid-1950's and, excepting some declines in the early 'sixties, have remained relatively constant over that time. During the past ten years, however, there has been a steadily declining discovery rate, to the extent that by 1972, reserves of crude petroleum in Manitoba were estimated at only 49 million barrels — roughly 0.6 per cent of total estimated reserves in Canada for that year.

Because of its modest production potential, Manitoba is dependent on outside sources for supplies of crude petroleum products. This situation is unlikely to change given the very low discovery rates in the Virden oil fields. The prospect is for increased importation into the province of refined as opposed to crude petroleum products as Imperial Oil consolidates its refining operations in Edmonton, Alberta.

Coal

Diagram 3 shows consumption of coal by demand sector for the year 1971. This diagram excludes coal used in thermal power plants. Almost half the coal consumed in the sectors examined is accounted for by the industrial sector. Lignite coal for use in thermal electric generation is imported from Saskatchewan for use in plants in Brandon, Winnipeg and Selkirk. Quantities of bituminous and sub-bituminous coal are also imported into the province for industrial and transportation purposes.

As is the case with both natural gas and petroleum, the majority of requirements for coal in Manitoba are met through inter-provincial transfers from fields located in Saskatchewan and Alberta.

Electricity

Diagram 3 also shows the consumption of electricity in all final demand sectors in Manitoba in 1971. Residential and commercial use of electricity account for slightly over 60 per cent of total consumption, followed by industrial use and by losses (such as those through transmission systems). Although not detailed here, the rise in the commercial segment of this market has been particularly striking and consumption in this sector now rivals that for residential and farm dwellings. Some fifteen years ago commercial consumption was only half that of residential and farm consumption.

In contrast to fossil fuels, electricity consumed in Manitoba is generated almost entirely within the province. The federal Department of Energy, Mines and Resources has estimated that in 1970 over 96 per cent of all electricity requirements in the province were generated by either the Manitoba or Winnipeg Hydro systems. Only very modest electricity requirements are met through transfers of power from other jurisdictions and usually occur in periods of peak demand on Manitoba and Winnipeg Hydro systems.

Given the very sharp increases in per capita consumption noted earlier, the ability to supply electricity from indigenous sources has been met through the efforts of Manitoba Hydro to install generating capacity within its overall system. Reliance has been placed on the development of a series of hydro-electric generating stations along the Nelson River in Manitoba, beginning with the Kettle Rapids station.

Summary

Manitoba cannot be described as being self-reliant in energy. The province depends almost exclusively on imports of fossil fuels to meet requirements for natural gas, petroleum products and for coal. Only in the case of electricity does Manitoba have indigenous capacity to fulfill

TABLE 4

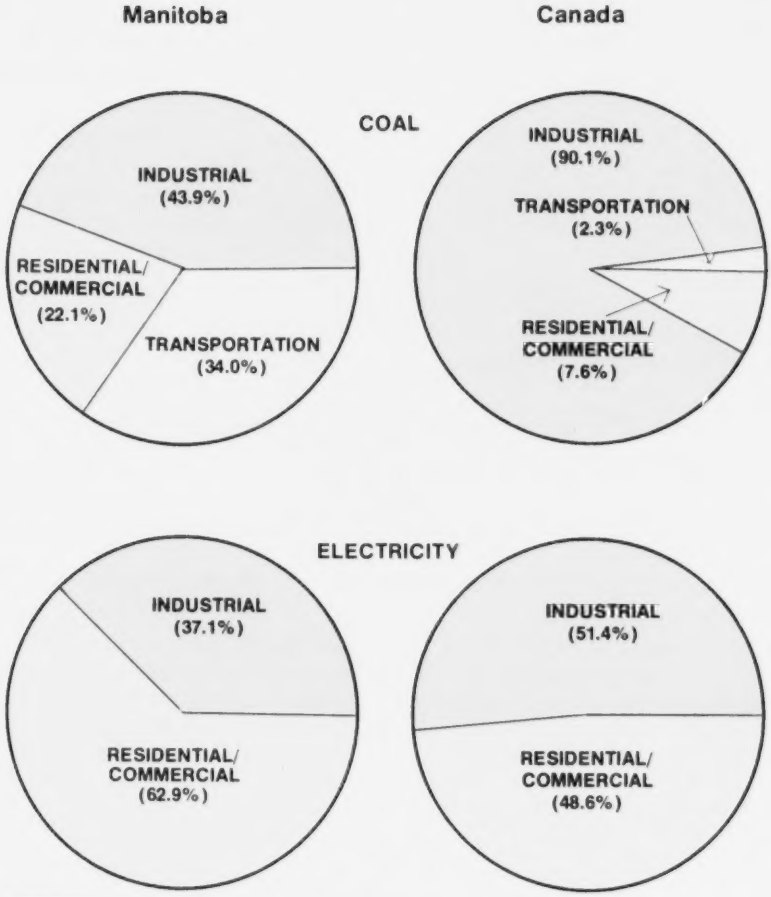
Manitoba Petroleum Production
1952 - 1972

	Barrels Produced	Value Of Sales $	Avg. Wellhead Price Per Bbl.
1952	107,119	181,561	1.69
1957	6,089,743	15,230,517	2.51
1962	3,926,736	9,499,987	2.40
1967	5,585,375	13,974,281	2.50
1972	5,256,939	14,586,159	2.77

Source: Manitoba Department of Mines, Resources and Environmental Management.

DIAGRAM 3

ENERGY DEMAND BY TYPE OF ENERGY IN MANITOBA & CANADA, 1971
BY PERCENT



Source: Statistics Canada

energy production requirements. Although electricity has been increasing its share of the total energy market in Manitoba, it only represents 16 per cent of total consumption in the residential/commercial, industrial and transportation sectors. There are, however, limits to the extent to which this energy form can be substituted for fossil-fuel-based energy forms:

1. Natural gas, petroleum and, to a small extent, coal are all used for residential and commercial space heating purposes in the province. Although electricity has been successful in competition with other fuels in the residential/commercial space heating market, costs of immediate wide-scale conversion could be substantial.
2. Electricity is not a realistic alternative for certain uses of energy such as specialized types of industrial applications and transportation.

Manitoba, therefore, will continue to rely heavily on the import of energy products in order to satisfy local consumption needs.

ROLE OF THE MANITOBA ENERGY COUNCIL

THROUGHOUT the 1960's, Manitoba enjoyed a relatively favourable position with respect to the supply, availability and price of energy forms. During this period Manitoba Hydro embarked on a major hydro-electric development program on the Nelson River, commencing with the Kettle Rapids generating station and including other sites such as Long Spruce.

In addition to this development of indigenous electricity supply, Manitoba was in a relatively favoured position with respect to the two major fossil fuels in use in Canada, that is, crude petroleum and natural gas. The accessibility of Alberta petroleum and natural gas ensured that Manitoba was able to obtain required quantities as necessary. The market penetration of natural gas was especially pronounced during this period when many households and apartments switched to natural gas from either coal or heating oil. At the end of the 1960's there appeared to be few problems with respect to energy in Manitoba, although from time to time concern was expressed over prices in Northern Manitoba or prices paid in the entire province compared to prices paid elsewhere.

Developments since 1970, however, have gradually eliminated the period of "cheap energy". Major increases in the world price of oil, occasioned by the Tripoli, Tehran and other agreements, have had an impact on the price of Canadian crude oil sold in Canada and in the United States. Coupled with this increase in world price has been the desire on the part of producers to exact higher prices in order to pay for development of petroleum reserves in the Arctic and in the Atlantic Ocean. Since rising prices for crude petroleum and refined petroleum products have meant that the premium in favour of natural gas has widened, there has also been pressure — particularly from the Province of Alberta — to raise wellhead prices for natural gas. To the extent that these costs are passed on to the transmission and gas distribution companies, they would also be reflected in higher consumer prices for natural gas.

Although costs and rates have not risen as rapidly in the electrical sector, Manitoba Hydro has also been faced with the prospect of increasing capital costs for construction at sites on the Nelson River. Higher capital costs are not only associated with the generating station itself, but also with transmission lines which must be built between these sites and major load centres in Winnipeg, Thompson, and other locations.

In February 1973 the Manitoba Cabinet, through an Order-In-Council, created The Manitoba Energy Council. This Council, chaired by the Minister of Industry and Commerce and including representatives of Manitoba Hydro, the Public Utilities Board, and certain government departments, is charged with the responsibility of developing and coordinating energy policy in Manitoba. Among other duties, the Council is charged with the responsibility of evaluating the short and long term needs for energy in the province, recommending policies to be pursued with respect to supply of indigenous and imported energy sources, developing positions for Federal/Provincial conferences on energy, and in general ensuring that the needs of Manitobans with respect to energy are met.

APPENDIX

TABLE 1

Manitoba Energy Consumption, 1971

	In BTU's x 10^{12}	Percentage
Oil	88	49.4
Gas	54	30.3
Coal	8	4.5
Electricity	28	15.7
	178	100.0

Source: Statistics Canada

TABLE 2

Industrial Energy Use And Average Price In Manitoba By Type 1969 And 1972

	1969		1972	
	Trillions of BTU's	$ per Million BTU's	Trillions of BTU's	$ per Million BTU's
COAL	2.61	0.43	5.97	0.37
OIL	3.81	1.04	6.73	1.12
GAS	15.28	0.30	18.56	0.33
ELECTRICITY	10.79	2.21	15.62	2.01

Source: Statistics Canada: Census of Manufactures, Electric Power Statistics, and Census of Mines, as well as Detail Energy Balance Sheets.

TABLE 3

Cost of Energy In Industry
Relative To Value Of Products
1969 - 1970 - 1971

Industry Group	Energy Input Per Unit of Product Output Per Year (In cents per dollar)		
	1969	1970	1971
Food and Beverages	1.07	1.10	1.07
Rubber & Plastic Products	—	1.07	0.96
Leather	0.74	0.86	0.78
Textile	0.85	0.49	0.69
Knitting Mills	—	0.69	0.58
Clothing	0.32	0.30	0.29
Wood	1.91	1.63	1.51
Furniture and Fixtures	0.95	0.78	0.77
Paper and Allied Products	3.64	3.52	3.56
Printing, Publishing & Allied	0.72	0.62	0.61
Primary Metal Products	14.38	14.60	14.27
Metal Fabricating	0.96	0.93	0.85
Machinery (except electrical)	0.71	0.69	0.72
Transportation Equipment	1.03	1.33	1.18
Electrical Products	0.85	0.80	0.76
Non-metallic Mineral Products	8.75	6.15	5.84
Chemicals & Chemical Products	4.14	4.90	5.59
Totals	2.05	2.08	2.06

Source: Statistics Canada

TABLE 4

Principal Fuel For Space Heating
Manitoba And Canada, 1961 And 1971

	Manitoba				Canada			
	1961		1971		1961		1971	
HEATING FUEL	No. of Households	% of Total	No. of Households	% of Total	No. of Households	% of Total	No. of Households	% of Total
Coal & Coke	48,524	20.3	6,100	2.1	480,794	10.6	65,730	1.1
Wood	26,737	11.2	11,210	3.9	590,101	13.0	212,945	3.5
Oil & Liquid Fuel	113,952	47.5	92,910	32.2	2,565,415	56.3	3,441,220	57.1
Piped Gas	45,434	18.9	153,375	53.3	857,953	18.8	1,935,570	32.1
Bottled Gas	757	0.3	3,345	1.2				
Electricity	186	0.1	19,325	6.7	60,229	1.3	375,345	6.2
Other	4,164	1.7	1,650	0.6				
TOTALS	239,754	100.0	287,915	100.0	4,554,493	100.0	6,030,810	100.0

Source: Statistics Canada

TABLE 5

Home Heating Oil & Regular Gasoline Prices As At Dec. 31, 1970-1973

(Cents/Gallon)

	No. 2 Fuel Oil				Gasoline			
YEAR	1970	1971	1972	1973	1970	1971	1972	1973
Halifax	19.0	21.7	22.7	33.2	51.1	53.4	55.4	66.0
Montreal	18.9	21.9	22.9	33.6	46.8	47.8	46.3	65.0
Ottawa	20.5	23.0	24.0	34.8	47.8	49.6	46.8	64.6
Toronto	20.9	22.9	22.9	27.1	51.4	52.7	53.7	58.7
Winnipeg	18.9	19.9	19.9	24.1	48.7	51.4	51.0	55.3
Regina	17.8	19.8	19.9	24.4	51.0	52.9	50.2	56.7
Calgary		not priced			46.6	49.0	49.1	52.0
Vancouver	20.5	22.3	23.3	27.6	47.0	50.8	51.8	56.0

Source: Statistics Canada, Prices Division

TABLE 6

Manitoba Refinery Sales
(In '000 Barrels & As Percentage)

		% of Total Net Sales	
		Manitoba	Canada
Gasoline	9,520	47.8%	33.4%
Diesel	4,061	20.4	10.2
Light Fuel Oil	1,808	9.1	17.3
Aviation Turbo Fuel	1,163	5.8	3.3
Kerosene, Stove & Tractor	1,092	5.5	2.9
Heavy Fuel Oil	912	4.6	20.7
Still Gas	791	4.0	3.1
Other	575	2.9	9.1
TOTAL	19,922	100.0%	100.0%

Source: Statistics Canada

TABLE 7

Values in Heat Units	BTU's *
Coal - Bituminous, per ton of 2000 lb	26,200,000
Sub-bituminous, per ton of 2000 lb	19,000,000
Lignite, per ton of 2000 lb	14,000,000
Petroleum - per barrel of 35 Canadian Gallons	
Liquid propane	3,550,000
Liquid butane	4,305,000
L.P.G. average	4,000,000
Aviation gasoline	5,050,000
Motor gasoline	5,222,000
Turbo fuel	5,414,500
Kerosene and stove oil	5,677,000
Diesel and light fuel oil	5,827,500
Heavy fuel oil	6,293,000
Natural gas, BTU's per Mcf	1,000,000
Electricity, BTU's per kwh.	3,412
Manufactured gas, BTU's per Mcf	550,000

* BTU - the amount of heat required to raise the temperature of one pound of water one degree Fahrenheit.

Source: An Energy Policy for Canada, Canada Department of Energy, Mines and Resources, Ottawa, 1973

THE MANITOBA ENERGY COUNCIL
Room 358, Legislative Building
Winnipeg, Manitoba, Canada
R3C 0V8

PRINTED IN CANADA
(6M—11/74)